NUTRIENT CRITERIA DEVELOPMENT PLAN

FOR THE COMMONWEALTH OF VIRGINIA

MARCH 24, 2004

With March 2006 Updates

All 2006 Updates Provided in Italics

<u>With August 2008 Updates</u>

<u>All 2008 Updates Provided in Underlined Italics</u>

DEPARTMENT OF ENVIRONMENTAL QUALITY

WATER DIVISION

OFFICE OF WATER QUALITY PROGRAMS

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PURPOSE

This plan is intended to provide a framework for developing nutrient water quality standards for the Commonwealth of Virginia. The document has been prepared by the Department of Environmental Quality (DEQ) in response to guidance issued by the United States Environmental Protection Agency (EPA). Although this state nutrient criteria development plan is optional, EPA encouraged the States to submit a plan by October 31, 2002 in order to assure EPA of the State's intent to develop nutrient criteria.

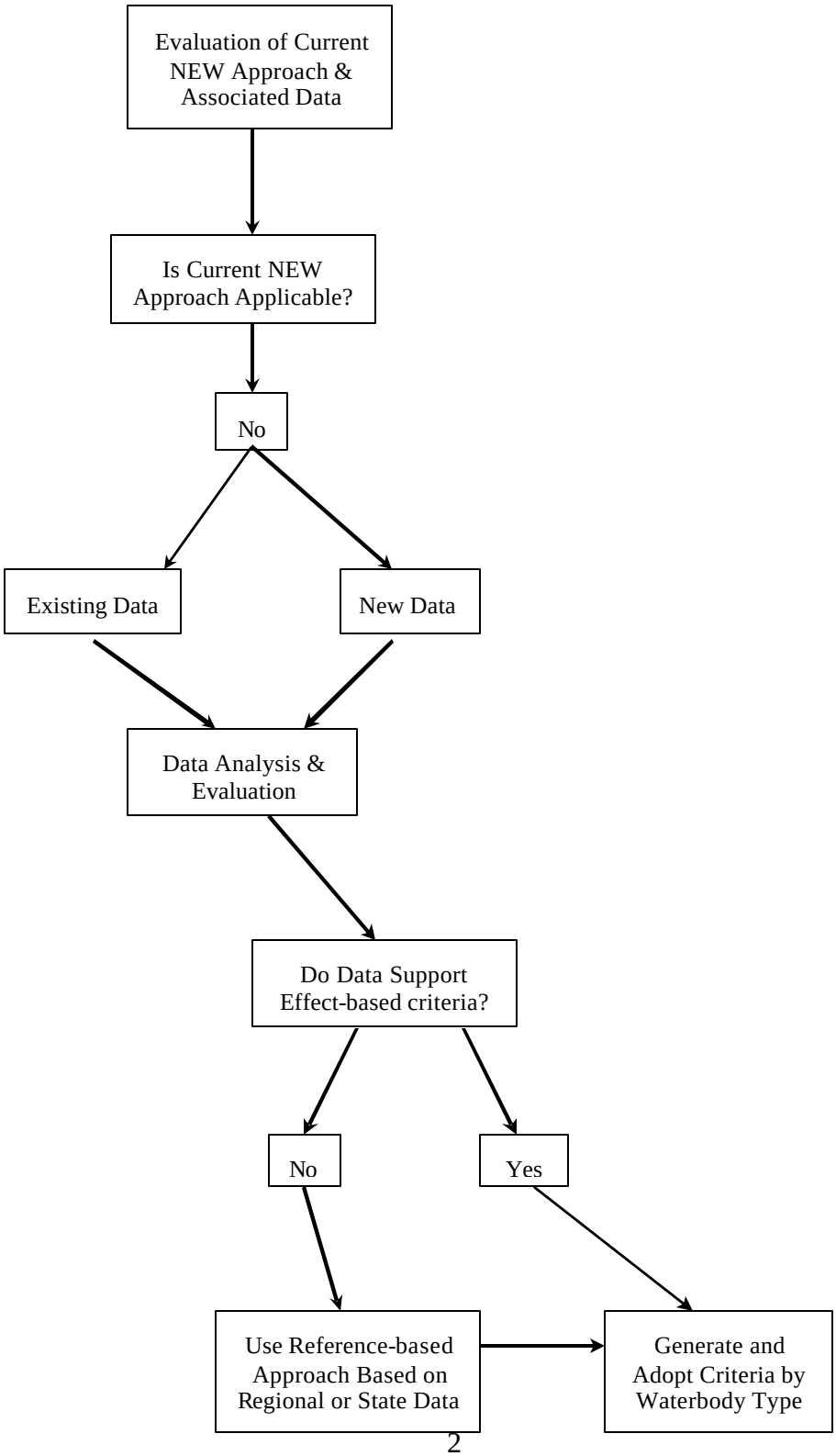
In this plan DEQ explains its intent to develop state specific criteria rather than adopt the EPA published national 304(a) nutrient criteria and outlines the work to be performed, status of data analysis, options for criteria development, and time schedule for developing and adopting nutrient criteria into the Virginia water quality standards regulation.

The information in this plan is preliminary and will be subject to revision as the DEQ, EPA, stakeholders and the general public review the Commonwealth's criteria development. EPA Region III will review the initial plan submission and advise the state if changes are needed. Once a mutually acceptable version of the plan is completed, EPA will public notice the State plan in the Federal Register. EPA will then use the plan to track the State's progress in nutrient criteria development. If the State keeps to the schedule contained in the Plan EPA should not have to promulgate nutrient criteria for the State.

Update 2006: The most recent plan was approved in March 2004. This March 2006 submission represents an update to that plan since the VA DEQ has completed many of the milestones; therefore an update is necessary to reflect those accomplishments.

Update 2008: The March 2006 update to the plan was accepted by EPA in September 2006. This 2008 submission represents an update to that plan since EPA approved lake nutrient criteria are now in effect in Virginia and the timelines for nutrient criteria development for rivers and streams have been updated to reflect the EPA funded opportunity for Virginia to pilot a nutrient screening protocol.

General Schematic of Virginia Proposed Plan:



APPROACH

Preferred: Effect-based criteria will be considered as well as other options, including the development of nutrient criteria that reflect localized conditions and protect specific designated uses utilizing processes outlined in the EPA Technical Guidance Manuals (USEPA 2000 - 2001) or other scientifically defensible methods and appropriate water quality data (such as the current collaborative effort to develop nutrient criteria for the Chesapeake Bay).

This effort will also involve an evaluation of the applicability of Virginia's current regulatory program (Nutrient Enriched Waters) for controlling nutrients in state surface waters by water body type (estuaries, lakes and reservoirs, rivers and streams). Appendices A through E describe Virginia's regulatory designations of these Nutrient Enriched Waters. Designations are based upon an evaluation of local water quality data for one or more indicators of nutrient enrichment (chlorophyll a, total phosphorus and dissolved oxygen fluctuations); the waters are protected from further enrichment by a companion regulation for control of total phosphorus from point sources. This evaluation will consider expansion of the existing State approach to include designations of additional waters experiencing nutrient enriched problems and to address such issues as total nitrogen, watersheds and non-point sources.

If the concept of Nutrient Enriched Waters is not incorporated into the final approach selected by the State, a plan will have to be developed to transition from the existing regulatory Nutrient Enriched Waters listings to the new regulatory approach by sequentially deleting currently designated Nutrient Enriched Waters as the Commonwealth adopts nutrient criteria for those waters.

Fall-back: Reference condition-based criteria refined for Virginia from either the EPA Region III regional database or Virginia STORET database at ecoregion Level IV supplemented with new 2000-2002 Virginia CEDS monitoring data. Virginia may consider the choice of a percentile other than those suggested in 304(a) criteria documents and technical guidance manuals.

FORM

Instead of using the default 304(a) criteria for nutrients (either as numeric criteria or as a translator for narrative criteria) for rivers and lakes which were based on broad national aggregate ecoregion level 3 data, the State prefers to develop wherever possible, nutrient criteria that reflect localized conditions and protect specific designated uses utilizing processes outlined in the technical guidance manuals or other scientifically defensible methods and appropriate water quality data. Virginia and other States in EPA Region III are finding the 304(a) nutrient criteria to be too "broad brushed" to be applicable to these water body types in the individual states and think subregionalization or subclassification below the board ecoregion Level 3 is needed because of these heterogeneity issues. Therefore, Virginia and other EPA Region III states within the EPA Region III Regional Technical Assistance Group (RTAG) are working with EPA staff and their contractors on the development of a region specific database for rivers and lakes. However, before Virginia proceeds with using the EPA or State database for refining reference condition based criteria for lakes and rivers in Virginia, we would like to have the

benefit of the peer review comments on the 304(a) nutrient criteria and EPA's response to these comments. Virginia is also participating with other Chesapeake Bay states and EPA in the effort described below to develop Chesapeake Bay-specific nutrient criteria.

The parameters for which Virginia will set criteria will be water body type specific and in situations where the Commonwealth shares waters with another state, consideration will be given to consistency in parameter choice with the neighboring state.

Estuaries. Virginia is involved in the States/EPA collaborative effort (See Appendix F) to develop Chesapeake Bay-specific designated uses and associated numeric water quality criteria for dissolved oxygen, water clarity and chlorophyll a (response variables). Once EPA publishes the criteria (expected in April 2003), the State will consider the criteria and other scientific and technical support information before initiating the rulemaking to adopt appropriate uses and criteria for the Chesapeake Bay and its tidal tributaries.

Update 2006: These EPA criteria were published in 2003 with Addendums in 2004. These criteria have been adopted by Virginia and approved by EPA in June 2005. Virginia has two state-specific issues related to the Chesapeake Bay that were adopted by the Virginia Water Control Board which became effective in January 2006. These 2006 revisions included site-specific criteria for numerical chlorophyll a criteria in the James River and dissolved oxygen criteria for the Mattaponi and Pamunkey Rivers. This completes the Bay related nutrient criteria process.

Evaluation of Historical Approach. Prior to proceeding with development of quantitative criteria for causal (nitrogen and phosphorus) and response (chlorophyll **a** and water clarity -Secchi depth or turbidity) variables for water body types in Virginia other than the Chesapeake Bay estuary, the State will first evaluate the applicability of its current Nutrient Enriched Waters approach. This approach to the control of nutrient enrichment (Appendix E) is based on recommendations from a Technical Advisory Committee (TAC). The TAC was composed of 19 national and regional experts and formed in 1987 to advise the State staff on how to best deal in a regulatory framework with nutrient enrichment in VA waters including the Chesapeake Bay. The experts advised staff that criteria values for total phosphorus and total nitrogen were not appropriate criteria for all waters and regions of the state. Rather, the experts recommended that Virginia use response variables (25 ug/l chlorophyll a and dissolved oxygen fluctuations) and total phosphorus for specific water body types and recommended that the state not use total nitrogen as an indicator of nutrient enrichment.

Update 2006: In implementing this plan, the agency will continue to evaluate this Nutrient Enriched Waters historical approach to control nutrient enrichment as each water body type's nutrient criteria progressed through the rulemaking process. This evaluation resulted in the decision to eliminate Nutrient Enriched Waters designations for the Bay and its tidal tributary waters. This deletion is effective for the tidal waters; however the lakes nutrient enriched waters deletions are only proposed and still subject to agency and public evaluation.

Update 2008: Although the four lakes (Smith Mountain Lake, Lake Chesdin, South Fork Rivanna Reservoir, and Claytor Lake) listed as nutrient enriched waters mere initially proposed

for deletion as part of the lake and reservoir nutrient criteria rulemaking process, in the final adopted version of the amendments, these four lakes were retained in response to a recommendation received during the public comment period to retain the Nutrient Enriched Waters designations for these four lakes because of the historical protection from nutrient enrichment that the companion Nutrient Policy has provided by requiring a monthly average total phosphorus effluent limit of 2 mg/L for point source discharges over a certain flow. Therefore, the proposed deletion of the Nutrient Enriched Waters designation for the four lakes was removed from the final proposal that was adopted and became effective in August, 2007. Subsequent to this rulemaking, the lakes in the Chesapeake Bay drainage (Lake Chesdin and , South Fork Rivanna Reservoir) have been proposed for deeltion in the triennial review amendments to the water quality standards regulation; this rulemaking is scheduled to become effective in 2009.

Demonstrate Where Criteria Not Needed. The State also intends to direct some effort toward generating the data needed to support a decision to not adopt one or more of the criteria (such as total nitrogen in phosphorus limited lakes and other waters). This will be accomplished by the development from the state CEDS database TN/TP ratios for representative lakes, streams and rivers in each river basin as well as evaluation of several published reports on limiting nutrients in Virginia waters. The reports utilized will include – but not be limited to - USGS publications, bulletins from the Virginia Water Resources Research Center (Sherrard and Hoyle, 1977; Beaty and Parker, circa 1993), and algal growth potential bioassay data for selected lakes summarized in a 1982 report on EPA Clean Lakes Program funded monitoring and research in publicly accessible lakes and reservoirs in Virginia (SWCB, 1982). The Commonwealth will also evaluate existing monitoring data and consider as an option the establishment of criteria at ambient total nitrogen concentrations in freshwater rivers and streams if it can be demonstrated that these levels do not interfere with designated uses and do not contribute to an exceedence of a downstream criterion. The Commonwealth will start with criteria development in the estuary and work its way upstream so appropriate criteria will have already been established downstream.

Lakes and Reservoirs: The state will initially consider response variables such as chlorophyll "a," and a measure of water clarity (e.g. Secchi depth or photometer) for lakes and reservoirs as well as causal variables (total phosphorus but probably not total nitrogen). In lake waters that experience dissolved oxygen deficiency, dissolved oxygen may be added as a response variable. As part of this standards setting effort, the state will attempt to demonstrate via use attainability studies that in deepwater reservoirs and lakes some phosphorus enrichment may be consistent with a particular game fishery designated use. Use attainability analyses will likely also be useful for lakes that are unable to meet water quality standards due to flushing rate, depth stratification, internal nutrient recycling, or high watershed-area-to-lake-volume ratios. A model may be utilized to determine whether total phosphorus and dissolved oxygen parameters adequately protect a deep reservoir or lake's designated uses and chlorophyll a or secchi disk depth is not required as an independent criterion. VA DEQ plans to consider in the data evaluation phase seasonality and uses, especially for chlorophyll, as well as narrative regulatory translators expressed as percentages or other statistical factors or ratios. The State will calculate Carlson (1977) trophic state indices for the various parameters (total phosphorus, chlorophyll a and Secchi depth) at reference condition lakes and determine if there are redundant measures that

can be eliminated for certain lake types or conditions or seasons.

Update 2006: All of the above has been completed and the state has proposed chlorophyll a and total phosphorus criteria for lakes and reservoirs. The Notice of Public Comment and Hearing for these amendments was published in January 2006. See Appendix N.

Update 2008: These criteria were adopted in 2006 and effective in August 2007. See Appendix N.

Rivers and streams: The state will initially consider response variables such as chlorophyll a and turbidity for rivers and streams and causal variables (nitrogen and phosphorus) but also possibly consider a combined index for those variables appropriate at the ecoregion level. For plankton as well as periphyton (diatoms and other attached algae) dominated streams, an attempt will be made – if the Commonwealth identifies a source of funding for conducting the work in-house or obtains ecosystem specific data from nearby states – to construct quantitative relationships among nutrient criteria parameters such as total nitrogen and total phosphorus and parameters that are more directly related to or descriptive of the particular designated uses (possibly multivariate regression analysis to determine the threshold level of phosphorus and other parameters - such as sediment and flow - and an index of biological integrity developed form algal community survey data). As part of the effort to select appropriate criteria, the agency will also consider the percentage of wetted stream perimeter coverage of macrophytes as a potential criterion of nutrient enrichment.

Update 2006: The state has received the December 2005 draft AAC report which considers the use of downstream loading impacts and localized effects in wadeable and non wadeable streams. DEQ staff will continue to work with the AAC in the coming months to finalize the technical approach that will be used to develop the nutrient criteria for streams and rivers and determine whether the basis for the criteria will require additional data collection in or whether the criteria can be based on the scientific literature and studies completed in other areas of the country. Depending upon the technical approach used, the final adoption date for the criteria could range from 2008 to later in 2009 (See Appendix M). These issues are addressed in the Fiscal Year 2006 Work Plan of the Academic Advisory Committee for freshwater nutrient criteria and the December 2005 Draft Report of the VA Academic Advisory to the Va Department of Environmental Quality: Freshwater Nutrient Criteria for Rivers and Streams (Appendix O and P).

Update 2008: DEQ staff have continued to work with the AAC; Appendix 0 has been updated to contain the current Fiscal Year 2009 Work Plan of the Academic Advisory Committee for freshwater nutrient criteria.) The DEQ website at (http://www.deq.virginia.gov/wqs/rule.html#NUT2) contains several reports from 2004 – 2008 providing AAC analysis and recommendations for development of nutrient criteria for both wadeable and nonwadeable freshwater streams and rivers. The current focus for wadeable streams and rivers is a joint VA Tech/DEQ pilot program – with funding for this project from EPA – for a screening value approach to nutrient criteria development for freshwater wadeable streams. This project will be completed in calendar year 2009 and DEQ expects to start the regulatory process for wadeable streams in the second half of 2009. The regulatory process to

adopt amendments to the water quality standards regulation takes 18 – 24 months; the updated timeline for wadeable streams in Appendix M shows a completion date of 2011. The current focus of the AAC work for non-wadeable freshwater streams and rivers is on using fish community metrics and selected measures of nutrient concentration and trophic status to develop nutrient criteria for these waters; the updated timeline for non-wadeable freshwater streamsand rivers in Appendix M shows a completion date of 2012.

PROCESS

State Staffing and Resource Needs. Considerable multi-state and federal resources as well as in-house DEQ Chesapeake Bay Program staff have been utilized over a two year period in the development of Chesapeake Bay specific nutrient criteria, but similar resources are unavailable for nutrient criteria development for other water body types within the Commonwealth. DEQ technical staff resources (2.5 full time equivalents) within the water quality standards program are insufficient to concurrently handle the Chesapeake Bay rulemakings as well as the technical criteria development and rulemakings for lakes and rivers and triennial review and exceptional state waters (ONRW) rulemakings. There is no state or identified federal sources of funding available to hire additional full time or temporary wage employees to assist in this effort. Therefore, criteria development in Virginia out of necessity will be a phased two step process for each water body type as described in the section on prioritization and coverage so as to accomplish these tasks with existing staff resources. Although the Commonwealth has experienced significant budget reductions brought on by declining revenues, the Water Quality Standards and Biological Monitoring unit within the Office of Water Quality Programs (which has the responsibility for developing these criteria) has sought an alternative state source of funding for analysis of a portion of their fish tissue and sediment samples so that they can divert $19,000 of their contractual skilled support services this fiscal year and $22,000 next fiscal year to fund the work of a State Code mandated Academic Advisory Committee (AAC). Virginia DEQ is seeking sources of funding for data collection and analysis. Staff – in consultation with other EPA Region III states – has identified the need for monitoring data to explore an effects based approach for developing appropriate nutrient criteria for periphyton dominated streams (USEPA, 1999). If Maryland is successful in obtaining funding for such a proposed Region wide study, DEQ will utilize regional or central office staff to collect the required samples in Virginia. A biological monitoring program coordinator position was recently created within the standards and biological monitoring unit and it is anticipated that this individual plus some time freed for an existing position by transferring the biomonitoring coordination function to this new position will provide some additional staff resources to assist in this effort. If this Maryland project does not materialize, Virginia DEQ will have to either rely on data from the states of West Virginia and Kentucky for shared ecoregions or literature values. An in-house project team consisting of representatives from the standards and water permitting staff will be formed to ensure that, concurrent with the rulemakings, implementation guidance is developed for consistent application of the nutrient criteria to VPDES permitted facilities.

Administrative Procedures Necessary for Plan Implementation. Once the technical development phase of the nutrient criteria setting process is completed in Virginia, DEQ staff must initiate a rulemaking process with concurrent implementation guidance development. Any amendments which the DEQ makes to the Virginia water quality standards regulation must

conform with the agency Public Participation Guidelines (Appendix F) and the State Administrative Process Act (Appendix G). Included in this process is an economic analysis conducted by the Department of Planning and Budget; the economic impact on permittees would be part of this evaluation. The State rulemaking administrative process normally takes two years from the agency drafting of a notice of intended regulatory action (NOIRA). A generic rulemaking timeline is provided in Appendix H.

Involvement of Critical Decision-Makers. Recommendations based on input from an academic advisory committee, in-house DEQ technical staff and management, and a stakeholder workgroup – as well as public comment and staff response to that comment – will be provided to the State Water Control Board (Board). This seven-member citizen member board appointed by the Governor has the statutory authority to adopt and modify regulations, including the water quality standards. Board members will also run the public hearings for the various water body specific nutrient criteria rulemakings.

Public Participation and Stakeholder Involvement. Prior to submission of this plan to EPA, DEQ presented the plan for comment and review at a public noticed stakeholders meeting held in Richmond at the DEQ central office on October 22, 2002. DEQ also filed a notice in the Virginia Register for November 4, 2002 publication to provide for a 30 day public comment period on the plan posted on the DEQ Web site at ~~http://www.deq.state.va.us~~ *http://www.deq.virginia.gov/wqs/rule.html#NUT2*. DEQ intends to submit a revised plan to EPA fifteen days after the close of the comment period to include appropriate changes based on public comment.

During the criteria development phase, the State will rely on technical advice/expert opinion from in-house technical staff and an Academic Advisory Committee (with the addition of fishery scientists) which was formed by the Virginia Water Resources Research Center to provide advice on water monitoring and assessment issues as mandated by amendments to the State Code. A separate general stakeholders group composed of environmentalists, industrial, municipal wastewater and other interested parties will meet with DEQ staff at periodic (semiannual or quarterly) meetings to be advised of the efforts of the AAC and agency staff and to be consulted on these efforts. This group will assist in issues related to implementation of the criteria recommended by the technical workgroup. During the rulemaking process for adoption of water body specific nutrient criteria, the general public will have opportunities to comment in writing and in person during the NOIRA comment period/public meetings and later during the public comment period and hearings on the proposed criteria. These comments will be summarized with staff responses for the Board. In addition, as part of the public participatory approach, an ad hoc advisory committee will be formed to advise staff on development of the regulatory text for the amendments.

Outside Expertise for Data Analysis and Peer Review. The VA DEQ will initially utilize a technical workgroup (consisting of a core of AAC scientists) to aid staff in nutrient criteria development. This technical workgroup will consist of a small group of individuals knowledgeable in the response of aquatic systems to nutrients. This workgroup will consider options for developing nutrient criteria, offer suggestions for data needs, provide guidance on

options for data evaluation, and provide input on the final product/proposed regulatory language. Technical questions that will be posed to the AAC are included in Appendix I. The VA DEQ will evaluate their comments and suggestions to further define the development of nutrient criteria and to update the workplan.

REGIONALIZATION

Plan Integration With Adjacent States Sharing Waters. Virginia has six neighboring states (MD, NC, WVA, DC, TN, and KY) in two EPA regions (III and IV) where there may be potential downstream effects. There will be several opportunities for integration of the Virginia Plan with these adjacent states where waters are shared. This integration already exists for the Chesapeake Bay estuary via the ongoing EPA/States collaboration on development of nutrient criteria for the Bay; Maryland, the District of Columbia and West Virginia are the three adjacent Region III states involved in this effort. Virginia will also periodically consult – primarily via conference calls - with neighboring states, including Maryland, West Virginia and Kentucky, that share an interest in monitoring and nutrient criteria development for periphyton dominated streams. In addition, Virginia has since the early 1970s collaborated with the state of North Carolina on activities to reduce nutrient input from Virginia waters into the Chowan drainage including – upon petition from North Carolina – designating portions of the Chowan drainage within Virginia as Nutrient Enriched Waters. There is an existing agreement between Virginia and North Carolina that would apply in this situation. Virginia intends to address potential downstream effects on North Carolina waters as part of the rivers and stream nutrient criteria rulemaking. Virginia also routinely exchanges information with the Tennessee Valley Authority states and will consider downstream effects on these waters as part of the lakes and reservoirs nutrient criteria rulemaking.

Coordination of Efforts with Regional Technical Assistance Group: Virginia DEQ staff participate in the EPA Region III Regional Technical Assistance Group (RTAG) which has focused primarily on development of a regional freshwater data base for use in nutrient criteria development for rivers and streams and lakes and reservoirs. There are representatives to RTAG from the above named three neighboring states also located in EPA Region III.

CLASSIFICATION

For purposes of criteria development, state surface waters will first be classified by water body types: estuaries, lakes and reservoirs, and rivers and streams (plus wetlands once technical guidance is available) and then further subclassified.

Estuaries: As described in Appendix F, VA DEQ will divide the Chesapeake Bay drainage into regulatory designated use zones for different segments of the Bay based on depth, hydrology, and aquatic community where different water quality nutrient criteria will apply depending on the aquatic life found in that zone.

Update 2006: Virginia has adopted and EPA approved water quality standards to protect designated uses from the impacts on nutrients and suspended sediments in the Chesapeake Bay and its tidal tributaries.

Lakes and Reservoirs: The state - with the advice of the technical and stakeholder workgroups - will consider various classification schemes for lakes and reservoirs based on physical characteristics (depth, hydraulic residence time, and ratio of lake size to watershed size), natural trophic conditions, and designated uses. One of the size issues that will be considered are setting regulatory size thresholds (such as those less than 10 acres or with water residence time of less than 14 days) for lakes and reservoirs that would eliminate small lakes from the population. Consideration will also be given to whether or not criteria should be established for lakes and reservoirs without public access. VA DEQ will also consider pursuing "use attainability" studies to refine uses, especially for lakes with multiple uses, such as promoting a game fishery (Ney, 2001) while maintaining water clarity that promotes recreational swimming. The state will consider conducting a literature search of user perception surveys (Heiskary and Walker 1988 and 1995) of mulitpurpose lakes and reservoirs in determining appropriate criteria in lakes and reservoirs. If necessary, user perception surveys may also be conducted. The agency will also consider determining the appropriate, possibly more stringent criteria for a lake or reservoir that has a public water supply designated use. The relationship of waterbody depth and specific dissolved oxygen criteria be considered

Update 2006: *All of the above have been completed and the state has proposed chlorophyll a and total phosphorus criteria for lakes and reservoirs. See Appendix N.*

Update 2008: These criteria were adopted in 2006 and effective in August 2007. See Appendix N.

Rivers and Streams: VA DEQ will - in consultation with the technical and stakeholder workgroups - consider specific classification schemes for rivers and streams (stream order, flow rates, and plankton vs. periphyton dominated streams) before deciding on the best approach. If resources continue to be limited, the state will consider literature values or the use of criteria developed for periphyton dominated streams in adjoining states.

Update 2006: DEQ staff will continue to work with the AAC in the coming months to finalize the technical approach that will be used to develop the nutrient criteria and determine whether the basis for the criteria will require additional data collection in Virginia streams and rivers or whether the criteria can be based on the scientific literature and studies completed in other areas of the country. Depending upon the technical approach used, the final adoption date for the criteria could range from 2008 to later in 2009. See Appendix M for timeline and Appendix P for the December 2005 draft AAC Report.

Update 2008: DEQ staff have continued to work with the AAC; Appendix 0 has been updated to contain the current Fiscal Year 2009 Work Plan of the Academic Advisory Committee for freshwater nutrient criteria.) The DEQ website at (http://www.deq.virginia.gov/wqs/rule.html#NUT2) contains several reports from 2004 – 2008 providing AAC analysis and recommendations for development of nutrient criteria for both wadeable and nonwadeable freshwater streams and rivers. The current focus for wadeable streams and rivers is a joint VA Tech/DEQ pilot program – with EPA funding for this project from EPA – for a screening value approach to nutrient criteria development for freshwater wadeable streams. This project will be completed in calendar year 2009 and DEQ expects to

start the regulatory process for wadeable streams in the second half of 2009. The regulatory process to adopt amendments to the water quality standards regulation takes 18 – 24 months; the updated timeline for wadeable streams in Appendix M shows a completion date of 2011. The current focus of the AAC work for non-wadeable streams and rivers is on using fish community metrics and selected measues of nutrient concentration and trophic status to develop nutrient criteria for non-wadeable streams and rivers; the updated timeline for non-wadeable streams in Appendix M shows a completion date of 2012.

PRIORITIZATION & COVERAGE

Staff resource constraints, the need (contingent upon availability of resources) to collect additional data for streams and rivers, and the time needed to complete the technical criteria development process for each waterbody type will necessitate a sequential approach to nutrient criteria development in Virginia.

This sequential approach will allow criteria development and adoption of estuaries, followed by lakes and reservoirs and then streams and rivers so that the downstream effects can be predicted and addressed at each step in the process.

The State's approach can be described as a two step process – technical development of nutrient criteria and administrative adoption of the criteria – for each water body type. Prioritization of waters for criteria development and adoption will be based on availability of data to proceed with a rulemaking. Therefore, the first rulemaking will be for the Chesapeake Bay estuary because criteria for those waters are expected to be available by the spring of 2003 (see Appendix F). The technical criteria development process for lakes and reservoirs and collection of additional monitoring data for streams and rivers will run currently with the Bay rulemaking. Because a need has been identified for periphyton data for technical evaluations of streams and rivers, we will collect that information before the workgroup convenes on streams and rivers. By the time the Bay rulemaking is completed, nutrient criteria for lakes and reservoirs should be available to initiate a rulemaking to adopt criteria for those waters. Once the lakes rulemaking is underway, the technical development of criteria for rivers and streams will be initiated. The rivers and streams criteria development process will address all other estuarine waters not included in the Chesapeake Bay nutrient criteria rulemaking. This would address the coastal streams not named in the Chesapeake Bay criteria rulemaking, the ocean side of the Eastern Shore of Virginia and downstream effects on the North Carolina estuary from waters in the Virginia portion of the Chowan basin.

During and beyond the nutrient criteria rulemaking process, the Commonwealth will continue to involve several complementary strategies in its approach to the assessment and control of nutrient enrichment in surface waters. Virginia's current practice of assessing benthic impairments and low dissolved oxygen levels in lakes due to nutrient stresses as part of the 305(b) process can already lead to 303(d) listings and TMDL development of control measures.

Each of the three waterbody type specific rulemakings will include a proposal to rescind the listing for that particular waterbody type from the Nutrient Enriched Waters listing in Section 9 VAC 25-260-350.A of the Water Quality Standards regulation. By leaving these in place until

the waterbody type specific nutrient criterion is effective, Virginia can continue to maintain the current level of protection for these waters. Concurrent with the post public hearing 150-day time period for each rulemaking - as previously discussed in the resources section - agency project teams will be tasked with development of implementation plans for applying the new criteria to VPDES permitted facilities, including those previously protected by the total phosphorus effluent control policy that is a companion regulation to the nutrient enriched waters designations.

In addition to this regulatory approach, there are statutory approaches to managing nutrients in Virginia waters, including a ban - effective January 1 1988 - on the sale, manufacture or distribution for use of any cleaning agent containing more than 0.5 percent phosphorus by wright. More recently, the Virginia Legislature enacted the Water Quality Improvement Act, which became effective July 1, 1997, and provides monetary incentives for point source and non-point source control of nitrogen and phosphorus. The state code also mandates the development of tributary plans for restoration of the water quality and living resources of the Chesapeake Bay.

INVENTORY OF EXISTING DATA

Existing Data. A summary is provided of existing estuary, lakes and rivers data for Virginia in the attached Table 1 from the legacy1990-2000 STORET database supplemented by the more recent DEQ CEDS database through September 2002. Although saltwater/estuarine data for the Commonwealth are included in the table, the collaborative EPA/States effort to develop nutrient criteria for the Chesapeake Bay is nearing completion (spring of 2003) and would supersede any effort by Virginia to develop Bay specific criteria. Virginia will also consider for inclusion in the final database the 1990 –2000 STORET data from all Region III states that is being compiled at ecoregion level IV for Rivers and Streams and eventually for Lakes and Reservoirs if it will strengthen the available database of water quality information. However, the National database will not be utilized for state criteria development because of heterogeneity issues. Existing data from Region IV states that share Virginia's physiographic regions (*e.g.*, North Carolina and Kentucky) may also be useful.

Data Analysis. As part of the State criteria development process for inland/fresh waters, DEQ will inventory existing data for Virginia from STORET/CEDS and address (if have not already done so) QA/QC aspects of the existing data. The state will also address for various water types the duration (how long) and frequency (how often) in addition to magnitude (how much), explore seasonal or annual averaging period (based on monthly measurements – weekly not available), and possibly consider exceptions for extraordinary events such as a 100-year flood. Virginia may consider the choice of a percentile other than those suggested in 304(a) criteria documents and technical guidance manuals. For example, the currently listed Nutrient Enriched Waters in Virginia will be separated by water body type and reference curves will be developed for the various criteria to determine what percentile of the reference distribution could be a starting point for the criteria for these waters. In addition, the reference condition approach will be applied to waters with similar physical characteristics as described in an earlier section. Paired nutrient and effects data from waters with similar physical characteristics will also be plotted to determine an effects threshold that could help refine the criterion value. For example, Carlson's Trophic State Indices will be developed for the lakes and reservoirs for Secchi disk, total phosphorus and chlorophyll a data and compared to ranges of user perceived impairment in

aesthetic qualities and recreation potential developed by Heiskary and Walker (1988) and others.

Planned Data Collection: No algal identifications and counts or chlorophyll data exist for stream periphyton during the 1990 to present time period. As part of the criteria development process for freshwater rivers and streams, Virginia will consider the collection of new data as required (possibly stream and river periphyton and plankton). Due to the time lag involved in collection and assessment of these new data and the need for the analyzed data before serious consideration can be given to chlorophyll or indice criteria delineations based on plankton versus periphyton dominated streams as well as staff resource limitations, the State will likely schedule technical development of nutrient criteria for streams and rivers when these data are available rather than address both lakes and rivers in the same rulemaking. Use attainability studies may be needed to refine stream or lake uses, especially where seasonality or depth may be an issue in application of the criteria. Other situations where use attainability studies might prove useful would be where recreational/aesthetic uses might be impaired by the growth of periphyton at levels that are less than those that would impair benthic macroinvertebrates or other aquatic life uses. Similarly, the filamentous green algae that might be considered "nuisance" growth might be found to occur even under very low background nutrient concentrations during warm periods of stable flow. In these cases, it may be beneficial to refine the specific uses designated for a particular waterbody (e.g., full body contact uses vs. aquatic life uses). If existing studies on correlations between lake trophic indices and perceived nuisance conditions prove inappropriate, there may be a need to conduct state specific studies or to seek expert opinion on appropriate regional or state specific ratings.

DATA NEEDS

If periphyton monitoring proves infeasible either due to time or resource constraints, consideration will be given to a literature search of data on this effort and consultations with states located within the same ecoregions as Virginia that have collected and analyzed stream periphyton data. Literature searches may also be needed on characterization of waterbodies with similar physical characteristics.

ASSESSING PROGRESS

Timelines and schematic process diagrams which describe major milestones and the schedule for completion of the criteria setting process are provided in the text of this plan. In addition, Appendices K, L, and M provide color coded timelines for each of the three rulmakings (Chesapeake Bay, lakes/reservoirs and streams/rivers, respectively) with descriptions of each step of the rulemaking process from the pre-Notice of Intended Regulatory Action to the final publication in the Virginia Registrar and effective date of each amendment after EPA review and approval. The detail provided in these timelines allow EPA and other stakeholders to track the Commonwealth's progress through the rulemaking process for each waterbody type. These timelines and diagrams are supplemented by an overall narrative description of the process in the Prioritization & Coverage and Process sections and additional detailed information incorporated into this plan as Appendices G, H, and I.

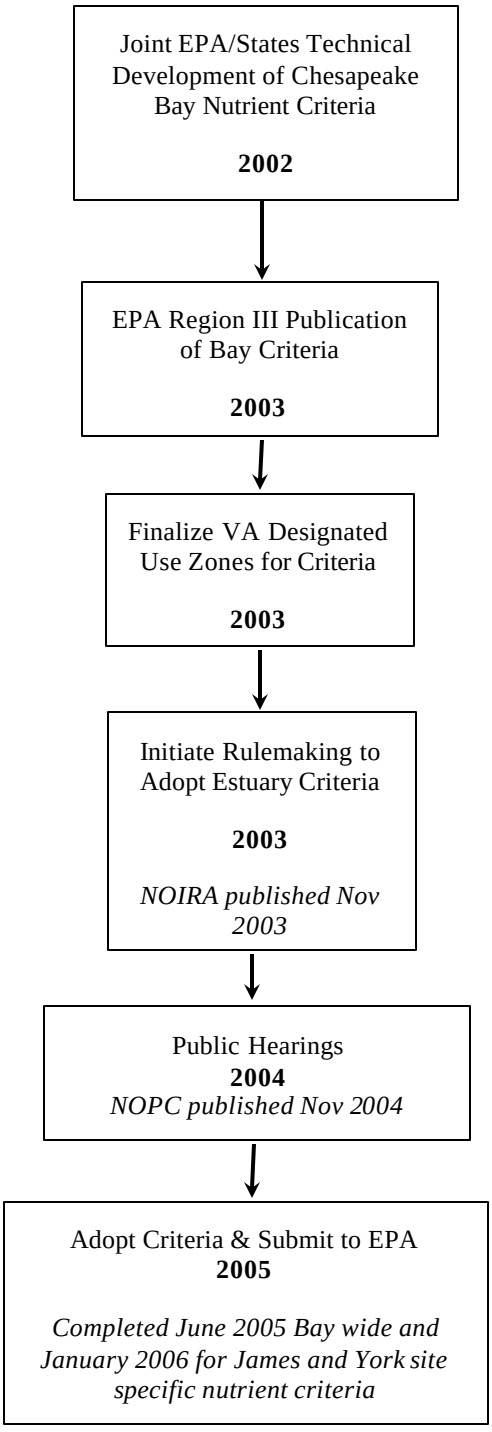
PLAN REVISIONS

This plan is provided to the EPA as an indication of the Virginia DEQ staff's efforts to develop and adopt nutrient criteria into the State water quality standards regulation. The Virginia DEQ will provide drafts of criteria for EPA review throughout the process and invite EPA staff to participate in the workgroups. From time to time peer review comments from the technical workgroup or the public participation process may necessitate revisions to the plan. Notification of revisions will be provided via letter to the EPA regional administrator and concurrently to the EPA Region III nutrient criteria coordinator and the water quality standards coordinator for Virginia. Virginia DEQ anticipates the 106 agreements will reflect adjustments to the plan.

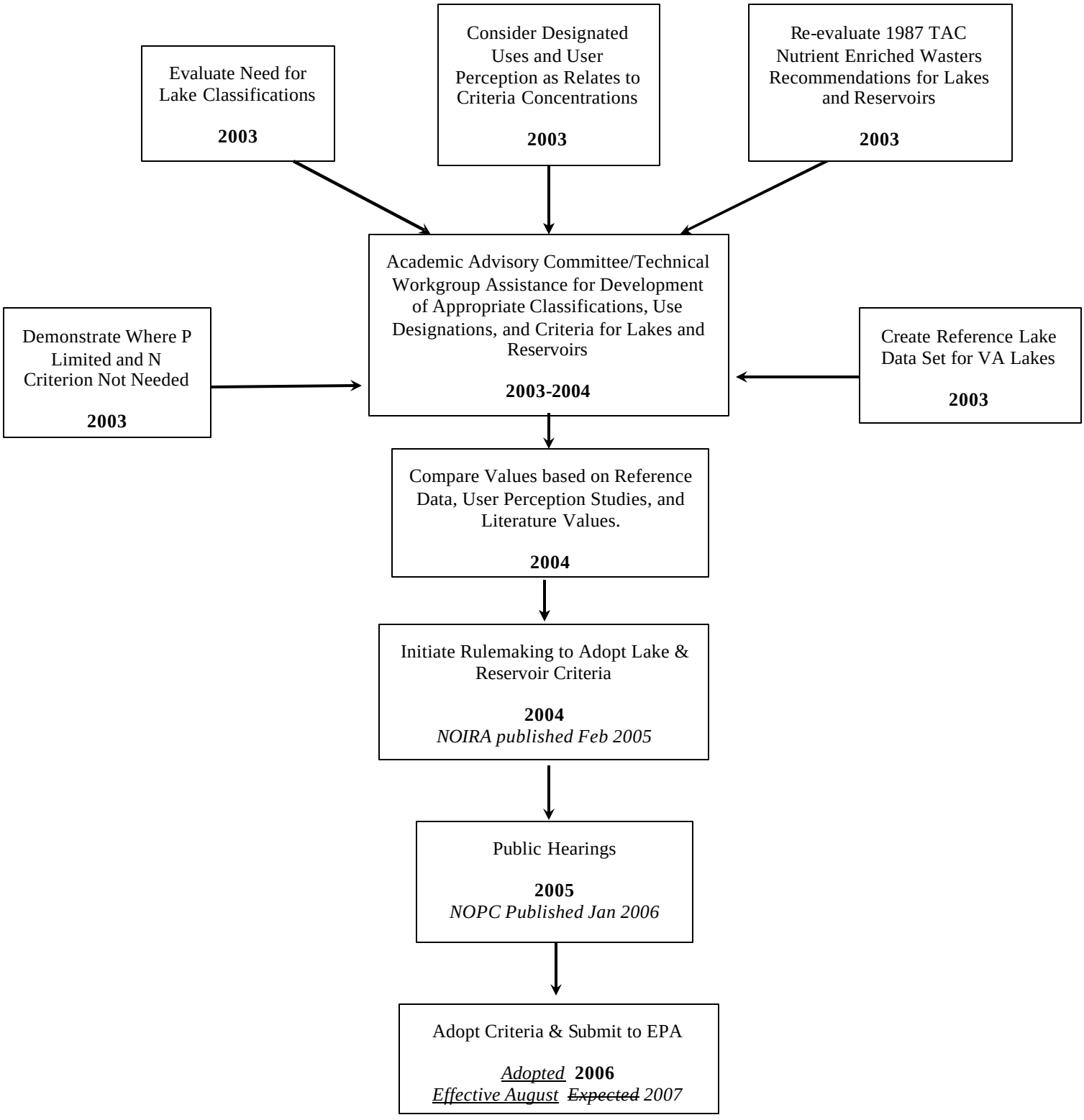
Table 1. Data Assessment.

	DO PROBE	DO WINKLER	TURBIDITY JTU	TURBIDITY FTU	SECCHI	TOTAL PHOSPHORUS	CHLOROPHYLL A CORRECTED	AMMONIA	NITRITE	NITRATE	TKN
	00299	00300	00070	00076	00078	00665	32211	00610	00615	00620	00625
ESTUARY	25317	1070	486	9523	4612	7608	2596	4927	4987	4992	7606
LAKE AND RESERVOIR	9159	400	47	2778	1370	3603	1411	3651	3589	3950	3575
RIVER AND STREAM	73812	8200	7244	48741	3704	65457	7291	62830	62869	62868	65192

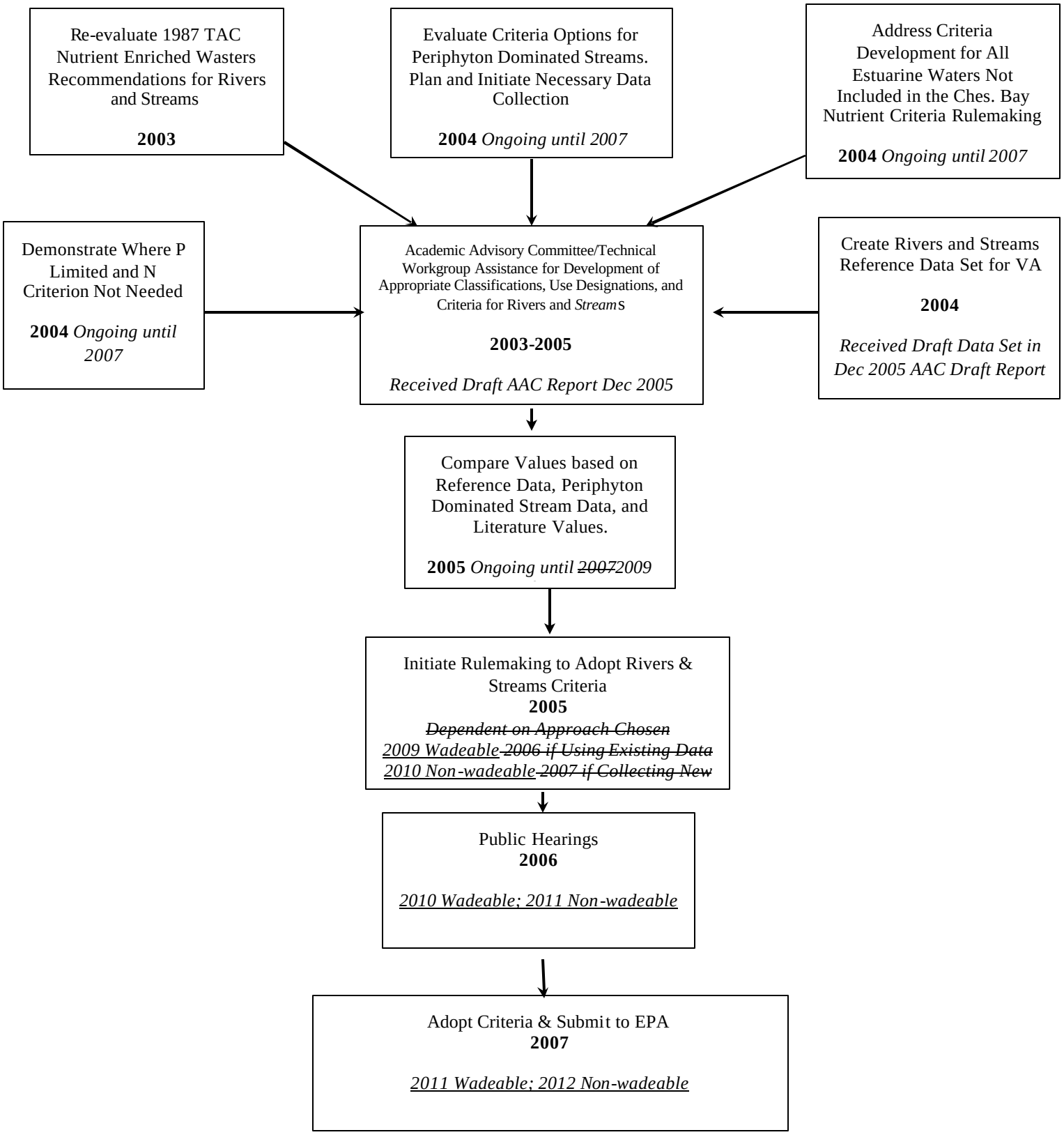
Schematic for Estuaries:



Schematic for Lakes and Reservoirs: *Updates 2206 and 2008*



Schematic for Rivers and Streams *Updates 2006 & 2008*:



Estuaries:

Activities and milestones for development of nutrient criteria for estuaries:

Year	Activities
2002	Joint EPA/States technical development of Chesapeake Bay nutrient criteria for dissolved oxygen, water clarity and chlorophyll a.
2003	EPA Region III publication of Bay criteria.
	Virginia DEQ determines boundaries for designated uses and matches to appropriate environmental endpoint for different segments of the Bay.
	Virginia issues NOIRA to initiate rulemaking to adopt nutrient criteria for the Virginia portion of the Chesapeake Bay. *NOIRA published Nov 2003.*
2004	Public hearings. *NOPC published Nov 2004.*
2005	Complete state rulemaking within 24 months after NOIRA published in Virginia Register and submit to EPA. *Completed June 2005 with Site Specific Numerical Chlorophyll for James and DO for York Completed in Jan 2006.*

Lakes and Reservoirs:

Activities and milestones for development of nutrient criteria for lakes and reservoirs:

Year	Activities
2003	Form technical (initially WQMIRA required Academic Advisory Committee) and stakeholder workgroups and as part of this effort re-evaluate 1987 TAC nutrient enriched waters recommendations.
	Evaluate the need for subdividing lakes into different classes, including classification issues of size, depth, retention time, run of the river impounded reservoirs vs. man made lakes vs. natural lakes, and public access vs. private ownership.
	Consider designated uses and user perception as it relates to criteria concentrations. Include issues about fishery and turbidity and nutrient levels. Design and implement user perception study or research suitable literature studies.
	Demonstrate where P limited and where N criterion is not needed.
	Evaluate feasibility of refining EPA's reference condition by creating a reference lake data set of least impacted lakes Virginia in and deriving values based on the nutrient levels found in these lakes.
2004	Compare values based on reference lake data, user perception studies, and literature values. Use expert opinion from AAC/technical workgroup for assistance with development of appropriate classifications, use designations and criteria for VA lakes and reservoirs.
	Issue NOIRA to initiate rulemaking to adopt nutrient criteria for lakes and reservoirs. *NOIRA published Feb 2005.*
2005	Public hearings. *NOPC published January 2006.*
2006	Complete state rulemaking within 24 months after NOIRA published in Virginia Register and submit to EPA. ~~*Completion expected April*~~ *Adopted June 2006 and effective August 2007.*

Rivers and Streams:

Activities and milestones for development of nutrient criteria for rivers and streams:

Year	Activities
2003	Form technical (initially WQMIRA required Academic Advisory Committee) and stakeholder workgroups and as part of this effort re-evaluate 1987 TAC nutrient enriched waters recommendations for rivers and streams.
2004	Use expert opinion from AAC/technical workgroup for assistance with periphyton vs. plankton dominated streams. Plan and initiate necessary data collection (monitoring and/or literature searches) and/or use of data from neighboring states in same sub-ecoregion. Demonstrate where P limited and where N criterion is not needed. Address criteria development for all estuarine waters not included in the Chesapeake Bay nutrient criteria rulemaking including the coastal streams not named in the Chesapeake Bay criteria rulemaking, the ocean side of the Eastern Shore of Virginia and eastern shore ocean side and downstream effects on the North Carolina estuary from waters in the Virginia portion of the Chowan basin. Evaluate feasibility of refining EPA's reference condition by creating a reference river and streams data set of least impacted Virginia freshwater rivers and streams and deriving values based on the nutrient levels found in these waters. *Ongoing until 2007.*
2005	Compare values based on reference rivers and streams data, periphyton dominated stream data, ambient levels, and literature values. Use expert opinion from AAC/technical workgroup for assistance with development of appropriate classifications, use designations and criteria for Virginia rivers and streams. *Draft AAC Report received Dec 2005.* *Ongoing through 2009.* Issue NOIRA to initiate rulemaking to adopt nutrient criteria for rivers and streams. *See dual timelines in update 2006 below.*
2006	Public hearings. ~~*See dual timelines in update 2006 below.*~~ *2009 for wadeable; 2010 for non-wadeable.*
2007	Complete state rulemaking within 24 months after NOIRA published in Virginia Register and submit to EPA. ~~*Expected 2008-2009 see dual timelines in update 2006 below.*~~ *2011 for Wadeable and 2012 for non-wadeable.*

~~*Update 2006: DEQ staff will continue to work with the AAC to finalize the technical approach that will be used to develop the nutrient criteria and determine whether the basis for the criteria*~~

~~*will require additional data collection in Virginia streams and rivers or whether the criteria can be based on the scientific literature and studies completed in other areas of the country. Depending upon the technical approach used, the final adoption date for the criteria could range from early 2008 to later in 2009 as follows.*~~

~~*2006 Period of existing literature and scientific review if deemed appropriate course of action.*~~

~~*2007(early) Issue NOIRA*~~

~~*2007(late) Issue NOPC and Public Hearing*~~

~~*2008 Complete state rulemaking within 24 months after NOIRA published in Virginia Register and submit to EPA*~~

~~**OR**~~

~~*2006-2007 Period of additional data collection if deemed appropriate course of action.*~~

~~*2008 Issue NOIRA*~~

~~*2009(early) Issue NOPC and Public Hearing*~~

~~*2009(late) Complete state rulemaking within 24 months after NOIRA published in Virginia Register and submit to EPA*~~

Wetlands:

It is not possible to predict a time schedule at this point for wetlands because the development of nutrient criteria for wetlands will be deferred until there is an EPA technical guidance document available for evaluation. However, Virginia will consider - as part of the technical development of nutrient criteria for lakes and reservoirs – site specific nutrient criteria for Lake Drummond, which is a natural dystrophic lake located within the Great Dismal Swamp.

Update 2008: Site specific nutrient critiera were developed as a special standard for Lake Drummond during the rulemaking for nutrient criteria for lakes and reservoirs which had an effective date of August 2007.

References Not Included in the Appendices:

Beaty, Myron H. and Bruce C. Parker. circa 1993. Investigations of Eutrophication in Mountain Lake, Giles County, Virginia. Virginia Water Resources Research Center. Bulletin 184.

Carlson, R.E. 1977. A trophic state index for lakes. Limnol. Oceanogr. 22:361-369.

Heiskary, S. A. and W.W. Walker, Jr. 1988. Developing phosphorus criteria for Minnesota lakes. Lake Reservoir Mange. 4(1):1-10.

Heiskary, S. A. and W.W. Walker, Jr. 1995. Establishing a chlorophyll-a goal for a rune-of-the-river reservoir. Lake Reservoir Mange. 11(1):67-76.

Ney, John. 2001. Develop multi-use criteria that optimize societal satisfaction in our standing surface waters. Fisheries management issue. LakeLine. 21(3).

Sherrard, Joseph H. and Joyce L. Hoyle. 1977.Virginia Water Research Bulletin No. 104 – A productivity study of the Roanoke River above Niagara Dam in Virginia.

State Water Control Board. Commonwealth of Virginia. 1982. Clean Lakes grant final report to EPA.

U.S. Environmental Protection Agency. 1999. Rapid bioassessment protocols for use in wadeable streams and rivers. Periphyton, benthic macroinvertebrates, and fish. Chapter 6, Periphyton protocols. 2nd ed. EPA-841-B-99-02.

U.S. Environmental Protection Agency. 2000. Technical Guidance Manual. Lakes and Reservoirs. EPA-822-B-00-001.

U.S. Environmental Protection Agency. 2000. Technical Guidance Manual. Rivers and Streams. EPA-822-B-00-002.

U.S. Environmental Protection Agency. 2001. Technical Guidance Manual. Estuaries and Coastal Waters. EPA-822-B-01-003.